Summary
This course discusses advanced methods extensively used for the processing, prediction, and classification of temporal (multi-dimensional and multi-channel) sequences. In this context, it also describes key links between signal processing, linear algebra, statistics and artificial neural networks.

Content
• Introduction: statistical (static and dynamic) pattern recognition, temporal pattern recognition problems

• Basic tools in temporal pattern modeling: Correlation, autocorrelation, linear/nonlinear AR, ARMA and ARCH modeling

• Statistical pattern recognition: Bayes classifiers, artificial neural networks (ANNs), discriminant functions, Expectation-Maximization algorithm, dynamic programming

• Sequence processing: discrete Markov models, hidden Markov models (HMM), autoregressive (AR)-HMM, hybrid HMM/ANN systems, parameter estimation (EM and forward-backward algorithms applied to these models)

• Laboratory exercises: in statistical pattern recognition, autoregressive modeling, Markov models and hidden Markov models

Note
Course notes (and relevant book chapters) available.

Keywords
Statistical modeling, Markov models, hidden Markov models, artificial neural networks for sequence processing.

Learning Prerequisites
Recommended courses
Undergraduate level statistics, linear algebra (matric computations, up to PCA) and minimum knowledge/interest in signal processing and machine learning. Programming in Matlab or similar.

Assessment methods
Multiple.

Resources
Websites
• http://www.idiap.ch/resource/lectures/statistical-sequence-processing